REMARKS

The Official Action mailed April 25, 2002 has been received and its contents carefully noted. Filed concurrently herewith is a *Request for Two Month Extension of Time*, which extends the shortened statutory period for response to September 25, 2002. Accordingly, Applicant respectfully submits that this response is being timely filed.

Applicants note with appreciation the consideration of the Information Disclosure Statements (IDS's) filed on October 14, 1999 and April 9, 2001. However, Applicants have not received acknowledgement of the IDS filed on March 21, 2002. Applicants respectfully request that the Examiner provide a copy of the initialed Form PTO-1449 evidencing consideration of the March 21, 2002 IDS.

The IDS filed December 18, 2001 was not considered by the Examiner since it was filed after a Final Office Action, as noted in Paper No. 19. The Applicants subsequently filed a Request for Continued Examination on January 18, 2002. Accordingly, the Applicants respectfully request that the Examiner provide a copy of the initialed Form PTO-1449 evidencing consideration of the December 18, 2001 IDS.

A further IDS is submitted herewith and careful review and consideration of this IDS is also requested.

Claims 15-26, 28 and 30-171 were pending in the present application. Claims 25, 26 and 116-122 have been canceled and claims 15, 17, 20, 22, 28 and 30-35 have been amended herewith. Accordingly, claims 15-24, 28, 30-115 and 123-171 are now pending in the present application, of which claims 15, 17, 20, 22, 28 and 30-35 are independent. For the reasons set forth in detail below, these claims are believed to be in condition for allowance.

The Official Action provisionally rejects claims 15-26, 28 and 30-171 under the doctrine of obviousness-type double patenting as being unpatentable over claims 5-35 of co-pending application number 09/352,194, and separately over claims 5-31, 45-68 and 81 of co-pending application number 09/352,373. The Official Action rejects claims 15-19, 20-24 and 28 under the doctrine of obviousness-type double patenting as being unpatentable over claim 1 of U.S. Patent 6,077,758 to Zhang et al. and U.S. Patent 5,529,937 to Zhang et al.; and claims 25-26 under the doctrine of obviousness-type

double patenting as being unpatentable over claim 1 of Zhang '758 and U.S. Patent 6,197,624 to Yamazaki et al.

In response to the double patenting rejections, the Applicants have cancelled claims 25, 26 and 116-122, and amended claims 15, 17, 20, 22, 28 and 30-35. The Applicants respectfully submit that the claims, as amended, are patentably distinct from the above-referenced co-pending applications and U.S. Patents. The Applicants respectfully request that the double patenting rejections be reconsidered.

The Official Action rejects claims 15, 28, 30, 31, 34-37, 40, 41, 44-46, 48, 49, 53, 55, 56, 74, 76, 77, 81, 83 and 84 as anticipated based on U.S. Patent 5,563,426 to Zhang et al.; claims 15-19, 28, 30, 31, 34, 35, 44-46, 49, 53, 56, 74, 77, 81 and 84 as anticipated by Zhang '937; and claims 15-24, 28, 30-115 and 123-171 as anticipated by U.S. Patent 6,077,731 to Yamazaki et al. In response, the Applicants have amended independent claims 15, 17, 20, 22, 28 and 30-35. The prior art does not teach or suggest all the elements of the independent claims, as amended, either explicitly or inherently. Specifically, the prior art does not teach or suggest that laser irradiation is conducted and the semiconductor film is heated in a reducing atmosphere to flatten asperities of the semiconductor surface formed by the laser light.

With respect to claims 15, 20, 28, 34 and 35, the prior art does not teach or suggest that laser irradiation is conducted and the semiconductor film is heated at a temperature of 900°C or higher in a reducing atmosphere to flatten asperities of the semiconductor surface formed by the laser light.

With respect to claims 30, 31 and 35, the prior art does not teach or suggest that laser irradiation is conducted and the semiconductor film is heated in an atmosphere which reduces an oxide formed over the semiconductor surface to flatten asperities of the semiconductor surface formed by the laser light.

With respect to claims 20 and 22, the prior art does not teach or suggest that ultraviolet light or infrared light is irradiated, and heat treatment is carried out in a reducing atmosphere after the irradiation of the ultraviolet light or the infrared light to flatten a surface of the crystalline semiconductor thin film.

Further, the Applicants respectfully submit that the Official Action has not properly interpreted the Yamazaki '731 patent. With respect to claims 20, 22 and 23,

the Official Action asserts that Yamazaki '731 teaches "carrying out a third treatment at 900-1100 °C in a reducing atmosphere" (p. 10). The Official Action then cites col. 13, lines 41-44 and col. 63, lines 56-61 as support for this assertion. The Applicants disagree. The Applicants have reviewed the Yamazaki '731 reference and respectfully submit that the third treatment is not carried out in a reducing atmosphere.

Also, claims 20 and 22 recite the feature of flattening a surface of the crystalline semiconductor thin film. This feature is not taught or suggested by Yamazaki '731.

Accordingly, reconsideration and withdrawal of the rejections of the claims under 35 U.S.C. § 102(b) and (e) are in order and respectfully requested.

The Official Action rejects claim 20 as obvious based on Zhang '937 and U.S. Patent 4,639,698 to Yamazaki et al. As noted above, the Applicants have amended claim 20. The prior art, either alone or in combination, does not teach or suggest all the features of independent claim 20, as amended. Specifically, the prior art does not teach or suggest that ultraviolet light or infrared light is irradiated, and heat treatment is carried out in a reducing atmosphere after the irradiation of the ultraviolet light or the infrared light to flatten a surface of the crystalline semiconductor thin film.

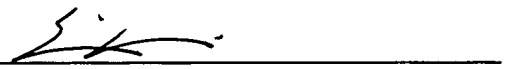
The Official Action rejects claims 25, 26 and 116-122 as obvious based on the '731 patent to Yamazaki. In response, the Applicants have canceled claims 25, 26 and 116-122.

The Official Action rejects dependent claims 88-94, 123-143 and 158-171 as obvious based on the combination of Zhang '426 and Yamazaki '731; and dependent claims 88-101, 123-143 and 158-171 as obvious based on the combination of Zhang '937 and Yamazaki '731. Please incorporate the arguments above with respect to the deficiencies in the prior art references. The prior art, either alone or in combination, does not teach or suggest all the features of the independent claims, as amended.

Accordingly, reconsideration and withdrawal of the rejection of the claims under 35 U.S.C. § 103(a) are in order and respectfully requested.

Should the Examiner believe that anything further would be desirable to place this application in better condition for allowance, the Examiner is invited to contact Applicant's undersigned attorney at the telephone number listed below.

Respectfully submitted,



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VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

Please cancel claims 25, 26 and 116-122 and amend claims 15, 17, 20, 22, 28, 30-35 as follows:

15. (Amended) A method of fabricating a semiconductor device comprising:

adding an element for facilitating crystallization of an amorphous semiconductor thin film to a part or an entire region of the amorphous semiconductor thin film;

carrying out a first heat treatment to transform the part or the entire region of the amorphous semiconductor thin film into a crystalline semiconductor thin film; [and]

irradiating a laser light to said crystalline semiconductor thin film; and

carrying out a second heat treatment for the crystalline semiconductor thin film at 900 to 1200 °C in a reducing atmosphere after the irradiation of said laser light,

wherein asperities of a surface of said crystalline semiconductor thin film are formed by said laser light, and said asperities are flattened by said second heat treatment.

17. (Amended) A method of fabricating a semiconductor device comprising:

adding an element for facilitating crystallization of an amorphous semiconductor thin film to a part or an entire region of the amorphous semiconductor thin film;

carrying out a first heat treatment to transform the part or the entire region of the amorphous semiconductor thin film into a crystalline semiconductor thin film; [and]

irradiating a laser light to said crystalline semiconductor thin film; and

carrying out a second heat treatment for the crystalline semiconductor thin film in a reducing atmosphere including a halogen element after the irradiation of said laser light,

wherein asperities of a surface of said crystalline semiconductor thin film are formed by said laser light, and said asperities are flattened by said second heat treatment.

20. (Amended) A method of fabricating a semiconductor device comprising:

adding an element for facilitating crystallization of an amorphous semiconductor thin film to a part or an entire region of the amorphous semiconductor thin film;

carrying out a first heat treatment to transform the part or the entire region of the amorphous semiconductor thin film into a crystalline semiconductor thin film;

carrying out a second heat treatment of irradiating the crystalline semiconductor thin film with ultraviolet light or infrared light; and

carrying out a third heat treatment for the crystalline semiconductor thin film at 900 to 1200 °C in a reducing atmosphere after the second heat treatment.

22. (Amended) A method of fabricating a semiconductor device comprising:

adding an element for facilitating crystallization of an amorphous semiconductor thin film to a part or an entire region of the amorphous semiconductor thin film;

carrying out a first heat treatment to transform the part or the entire region of the amorphous semiconductor thin film into a crystalline semiconductor thin film;

carrying out a second heat treatment of irradiating the crystalline semiconductor thin film with ultraviolet light or infrared light; and

carrying out a third heat treatment for the crystalline semiconductor thin film in a reducing atmosphere including a halogen element after the second heat treatment.

28. (Amended) A method of fabricating a semiconductor device comprising:

adding an element for facilitating crystallization of an amorphous semiconductor thin film to at least a portion of the amorphous semiconductor thin film;

carrying out a first heat treatment to transform the at least a portion of the amorphous semiconductor thin film into a crystalline semiconductor thin film; and

irradiating a laser light to said crystalline semiconductor thin film; and

carrying out a second heat treatment for the crystalline semiconductor thin film at 900 to 1200 °C in an atmosphere containing hydrogen therein after the irradiation of said laser light [to flatten a surface of the crystalline semiconductor thin film],

wherein asperities of a surface of said crystalline semiconductor thin film are formed by said laser light, and said asperities are flattened by said second heat treatment.

30. (Amended) A method of fabricating a semiconductor device comprising:

forming a semiconductor film comprising silicon over a substrate;

crystallizing said semiconductor film;

irradiating a laser light to the crystallized semiconductor film; and

subsequently heating [said] the crystallized semiconductor film provided with an oxide formed [on] over a surface thereof in an atmosphere which reduces said oxide formed [on] over said surface,

wherein asperities of a surface of the crystallized semiconductor film are formed by said laser light, and said asperities are flattened by said heating.

31. (Amended) A method of fabricating a semiconductor device comprising:

forming a semiconductor film comprising silicon over a substrate;

crystallizing said semiconductor film;

irradiating a laser light to the crystallized semiconductor film; and

subsequently heating [said] the crystallized semiconductor film provided with an oxide formed [on] over a surface thereof in an atmosphere which reduces said oxide formed [on] over said surface,

wherein said atmosphere comprises hydrogen, and

wherein asperities of a surface of the crystallized semiconductor film are formed by said laser light, and said asperities are flattened by said heating.

32. (Amended) A method of fabricating a semiconductor device comprising:

forming a semiconductor film comprising silicon over a substrate;

irradiating a laser light to said semiconductor film to [crystallizing] crystallize said semiconductor film;

etching a surface of [said] the crystallized semiconductor film after [said crystallizing step] the irradiation of said laser light to remove an oxide therefrom;

heating [said] the crystallized semiconductor film in a reducing atmosphere after said etching step to form a flattened surface of [said] the crystallized semiconductor film.

33. (Amended) A method of fabricating a semiconductor device comprising:

forming a semiconductor film comprising silicon over a substrate;

irradiating a laser light to said semiconductor film to [crystallizing] crystallize said semiconductor film;

treating a surface of [said] the crystallized semiconductor film with hydrofluoric acid after [said crystallizing step] the irradiation of said laser light to remove an oxide therefrom;

heating [said] the crystallized semiconductor film in a reducing atmosphere after said treating step to form a flattened surface of [said] the crystallized semiconductor film.

34. (Amended) A method of fabricating a semiconductor device comprising:

forming a semiconductor film comprising silicon over a substrate;

crystallizing said semiconductor film;

irradiating a laser light to the crystallized semiconductor film;

subsequently heating [said] the crystallized semiconductor film provided with an oxide formed [on] over a surface thereof at a temperature of 900 to 1200 °C in an atmosphere which reduces said oxide formed [on] over said surface,

wherein asperities of a surface of the crystallized semiconductor film are formed by said laser light, and said asperities are flattened by said heating.

35. (Amended) A method of fabricating a semiconductor device comprising:

forming a semiconductor film comprising silicon over a substrate;

crystallizing said semiconductor film;

irradiating a laser light to the crystallized semiconductor film;

subsequently heating [said] the crystallized semiconductor film provided with an oxide formed [on] over a surface thereof at a temperature of 900 to 1200 °C in an atmosphere which reduces said oxide formed [on] over said surface,

wherein said atmosphere comprises hydrogen, and

wherein asperities of a surface of the crystallized semiconductor film are formed by said laser light, and said asperities are flattened by said heating.